

FIG. 1

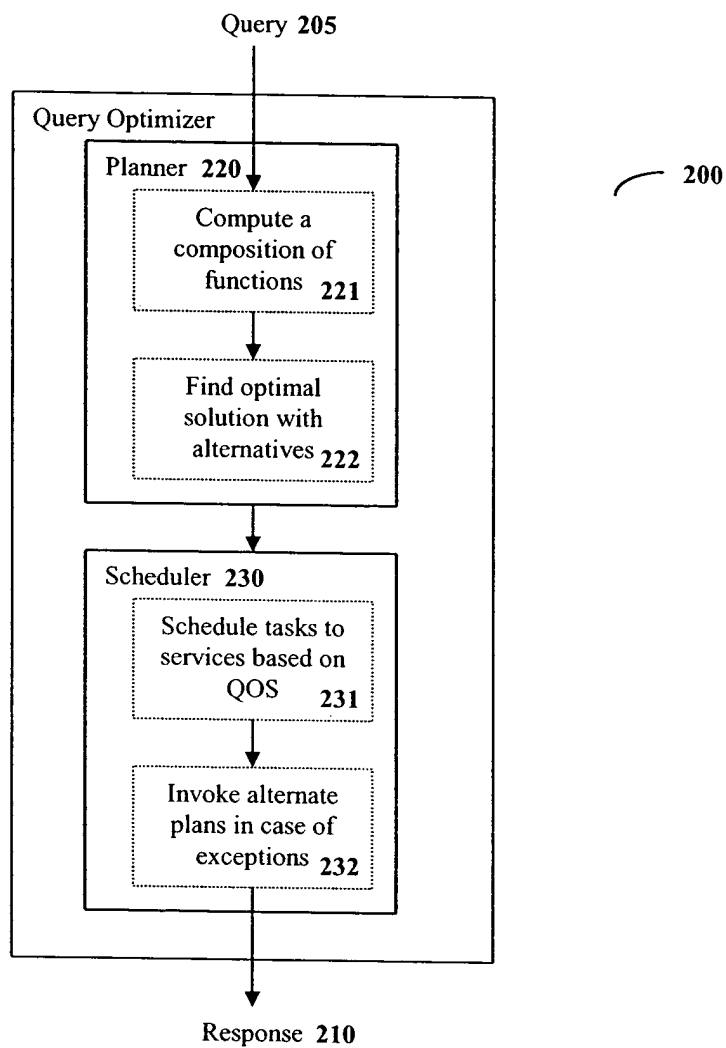


FIG. 2

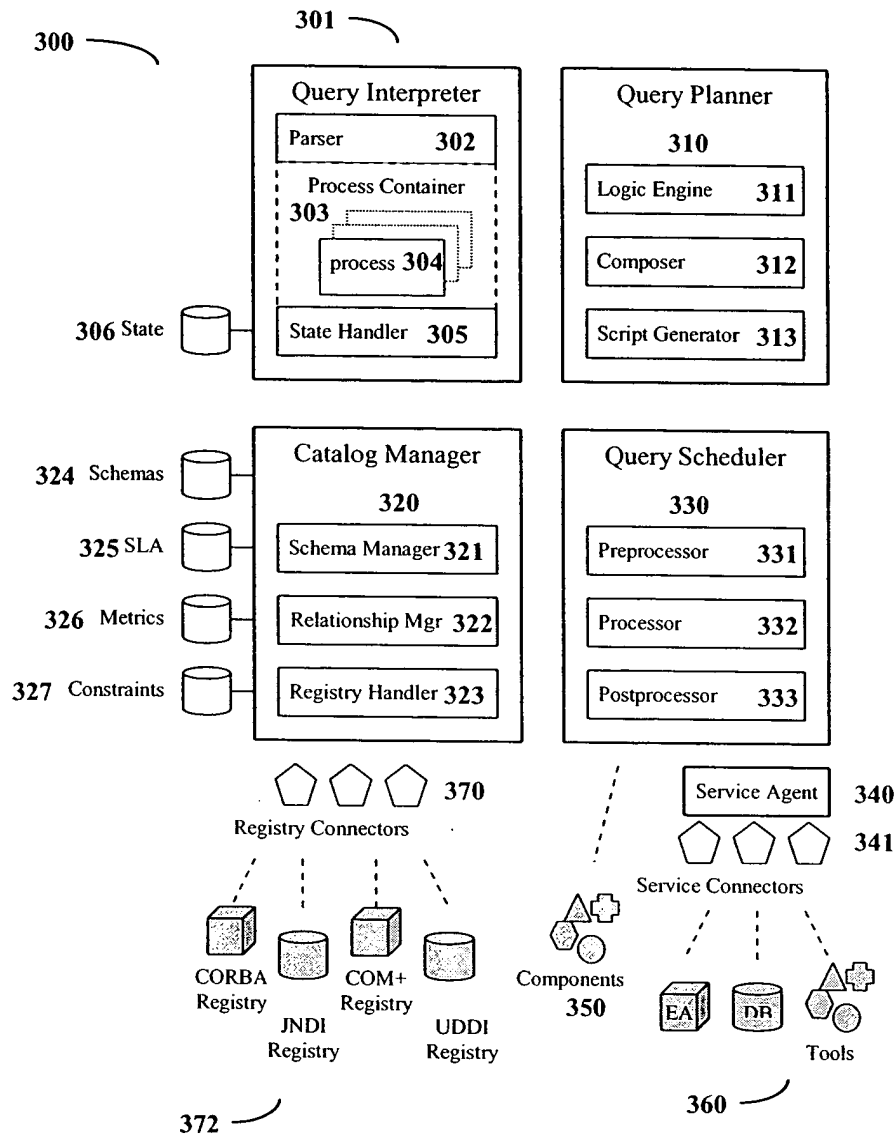


FIG. 3

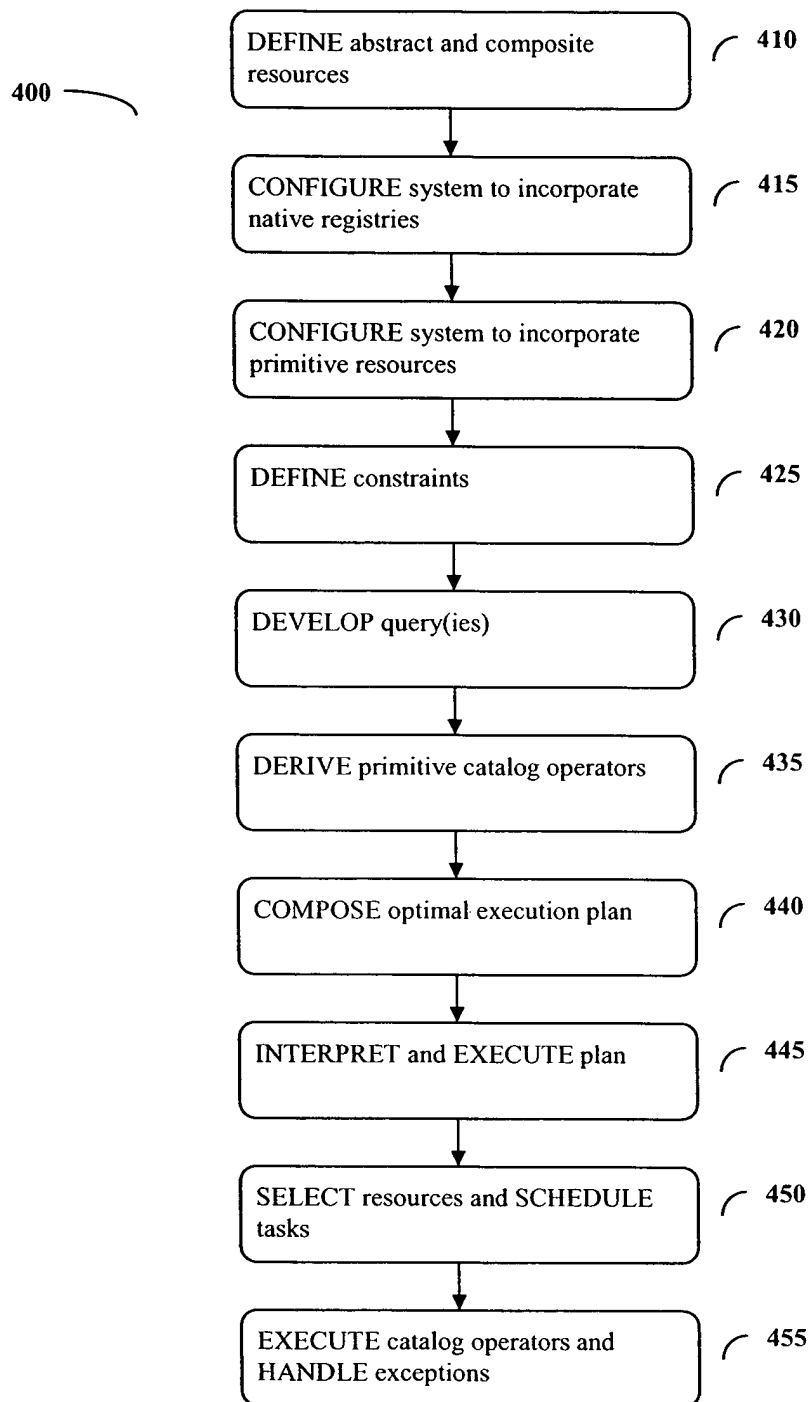


FIG. 4

500

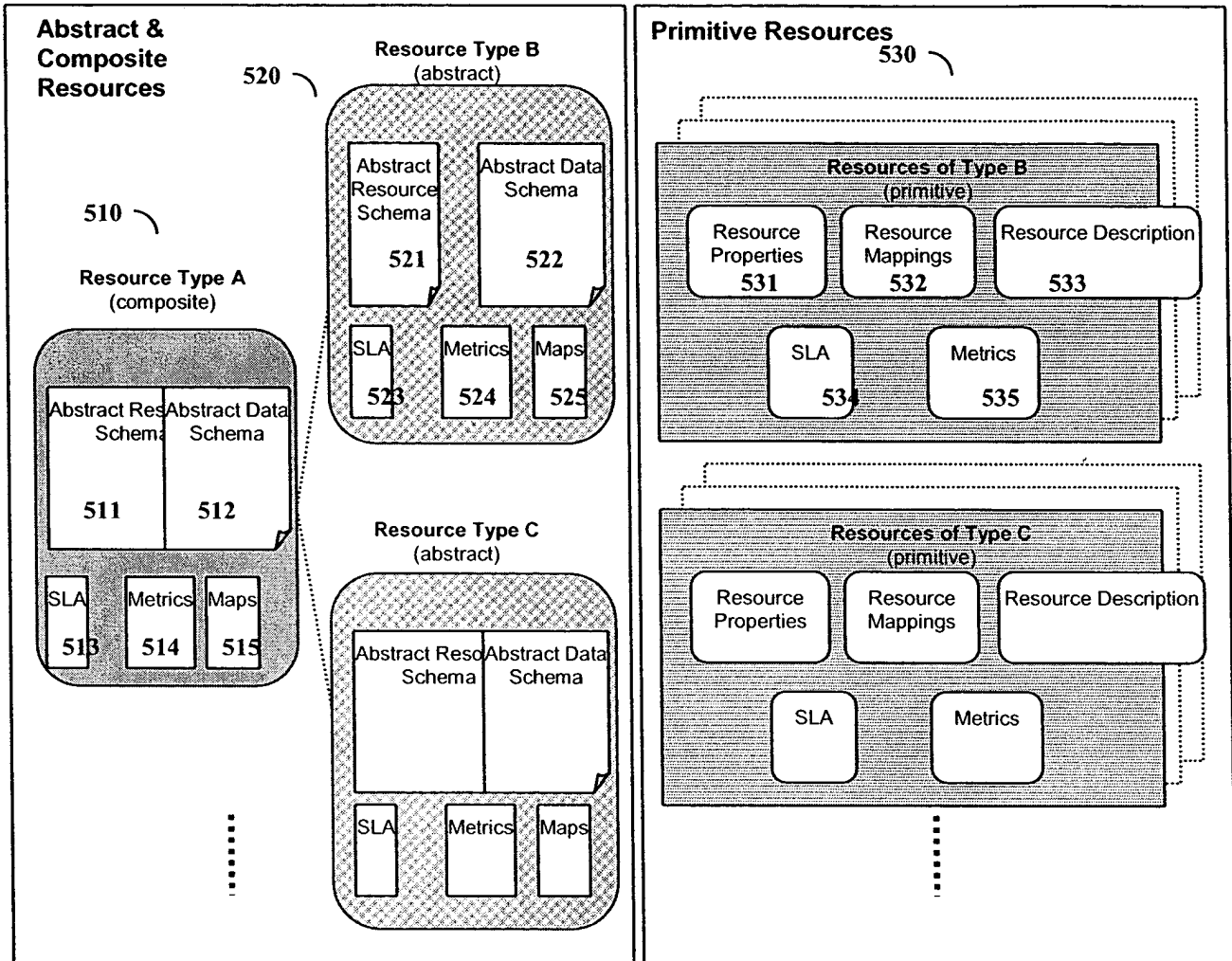


FIG. 5

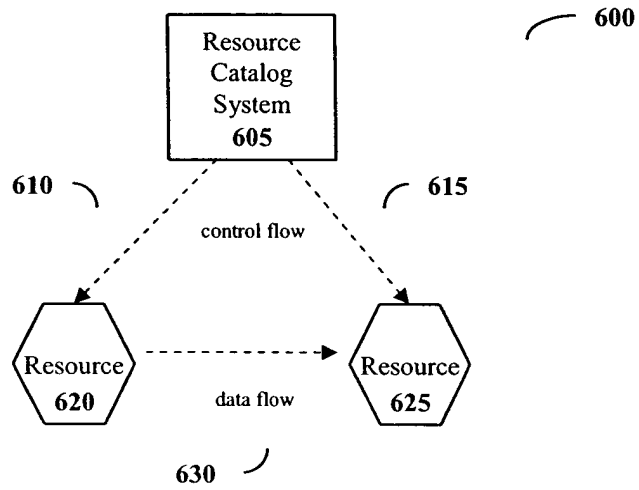


FIG. 6

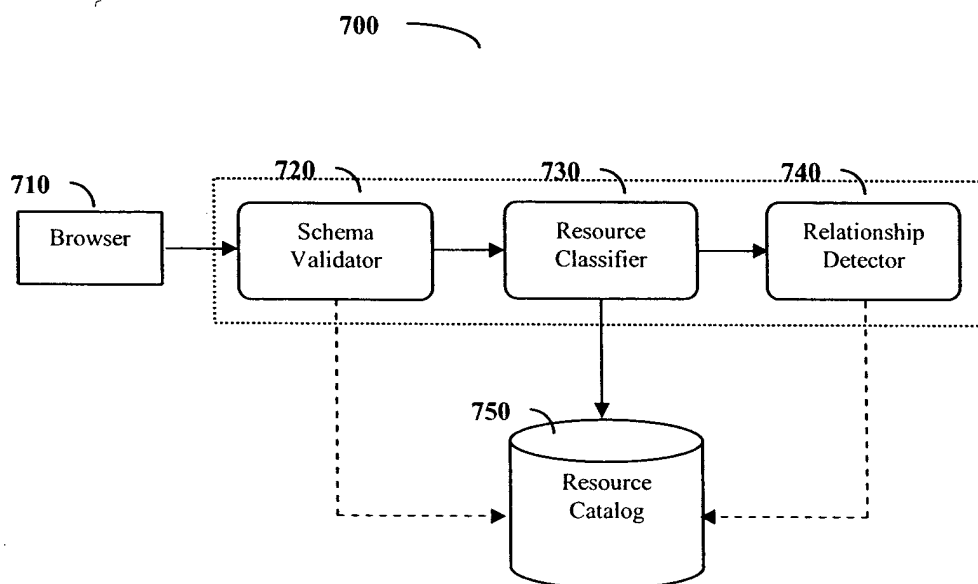


FIG. 7

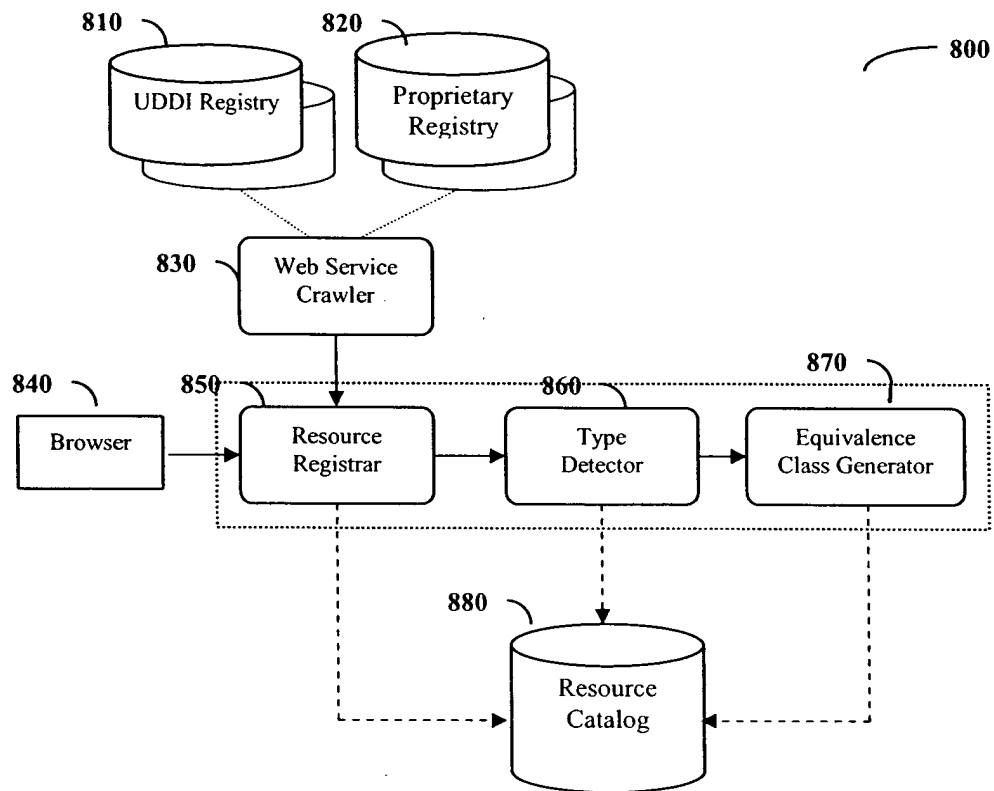


FIG. 8

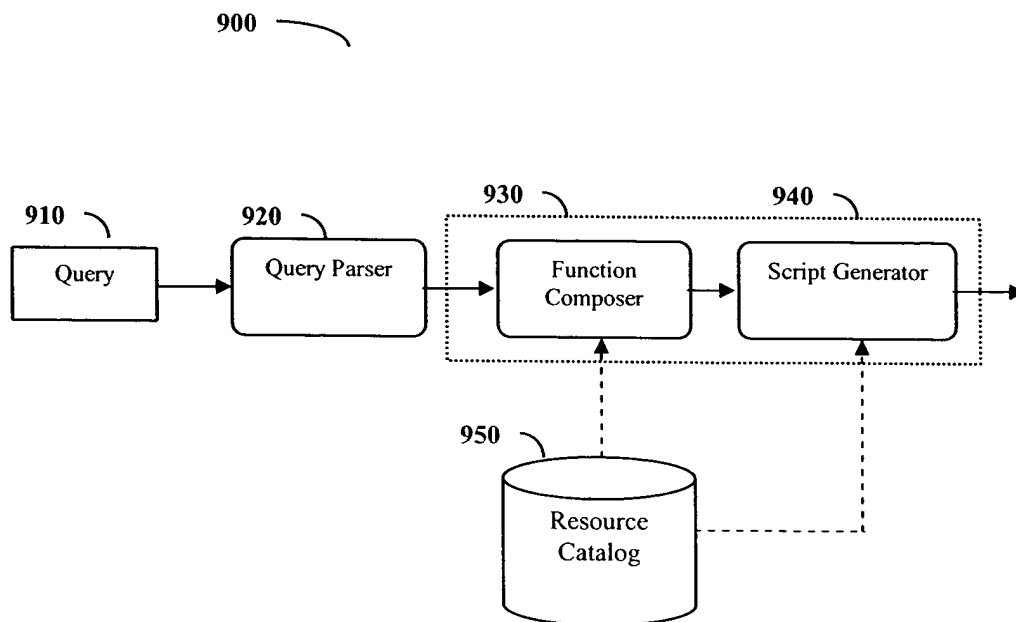


FIG. 9

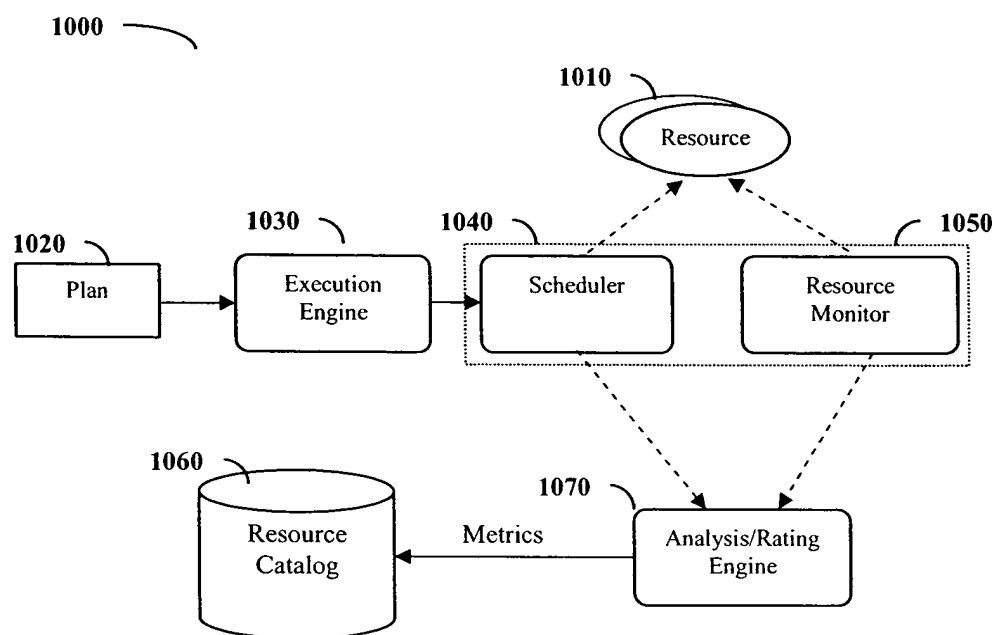


FIG. 10

1100

1110 INVOKE SEARCH_SERVICE.search, WM_SERVICE.watermark, DELIVERY_SERVICE.send
1120 WHERE
(/search_service/country = 'USA' OR /search_service/country = 'EUROPE') AND
1130 /search_service/data_size < 1,00,000 AND
/SLA/response_time < 10 AND 1140
/SLA/cost < \$2
GIVEN
1150 /search/location = 'internet-catalog' AND
/search/results_format = 'XML' AND
/search/max_results < 1000 AND 1160
/search/criteria = "camera AND SONY ..." AND
/watermark/type = 'text' AND
/watermark/label = '© Acme. All Rights Reserved.' AND
/watermark/placement = 'bottom-left' AND
/delivery/type = 'email' AND
/delivery/address = 'joe@z.com'
RESULTS
1170 /search/tracking_id
1180

FIG. 11

1200

1210

1220

```
<?xml version="1.0" encoding="UTF-8" ?>  
<script major="1" minor="0" name="Example Script" access="public">
```

1230

```
<var name="queryResults" type="string" access="public" />  
<var name="catalogName" type="string" access="private" />
```

1240

```
<task name="primary">
```

1250

```
<assign var="catalogName" select="Electronics Catalog" />
```

...

```
<call op="xci:acme.utility.SearchInitializer::initialize">  
  <in name="catalog" select="$catalogName" />  
  ...additional input parameters...  
  <out name="criteria" select="$xmlCriteria" />  
  ...additional output parameters...  
</call>
```

1260

```
<if test="not $bCached">
```

1270

1280

```
<query expression="INVOKE MetadataExportService WHERE  
  (/data/source=realestatecatalog AND /conversion/format=pdf)"  
  result="$queryResults"/>
```

...

```
</if>
```

```
<spawn tasks="taskA taskB"/>
```

1290

...

```
</task>
```

...

```
</script>
```

FIG. 12

1300

1310

<?xml version="1.0"?>

<component
 major="1" 1320
 minor="0"
 package="acme.example"
 name="Workflow">

 <metadata
 version="200" 1330
 createdBy="Acme, Inc."
 comment="Workflow provides an interface to the Workflow Manager in the Server."/>

 <operation
 name="doWork" 1340
 access="public" 1350

 <in name="binding" type="string"/>
 <in name="deadline" type="string"/>
 <out name="status" type="string"/>

 <throws> 1360
 <fault name="exception:InvalidParameterException"/>
 <fault name="exception:BindingException"/>
 <fault name="exception:InternalException"/>
 </throws>

 <implementation type="javaClass">
 <java classname="acme.example.WorkflowManagerInterface"
 methodname="submitWork"/> 1370
 </implementation>

 </operation>

</component>

FIG. 13

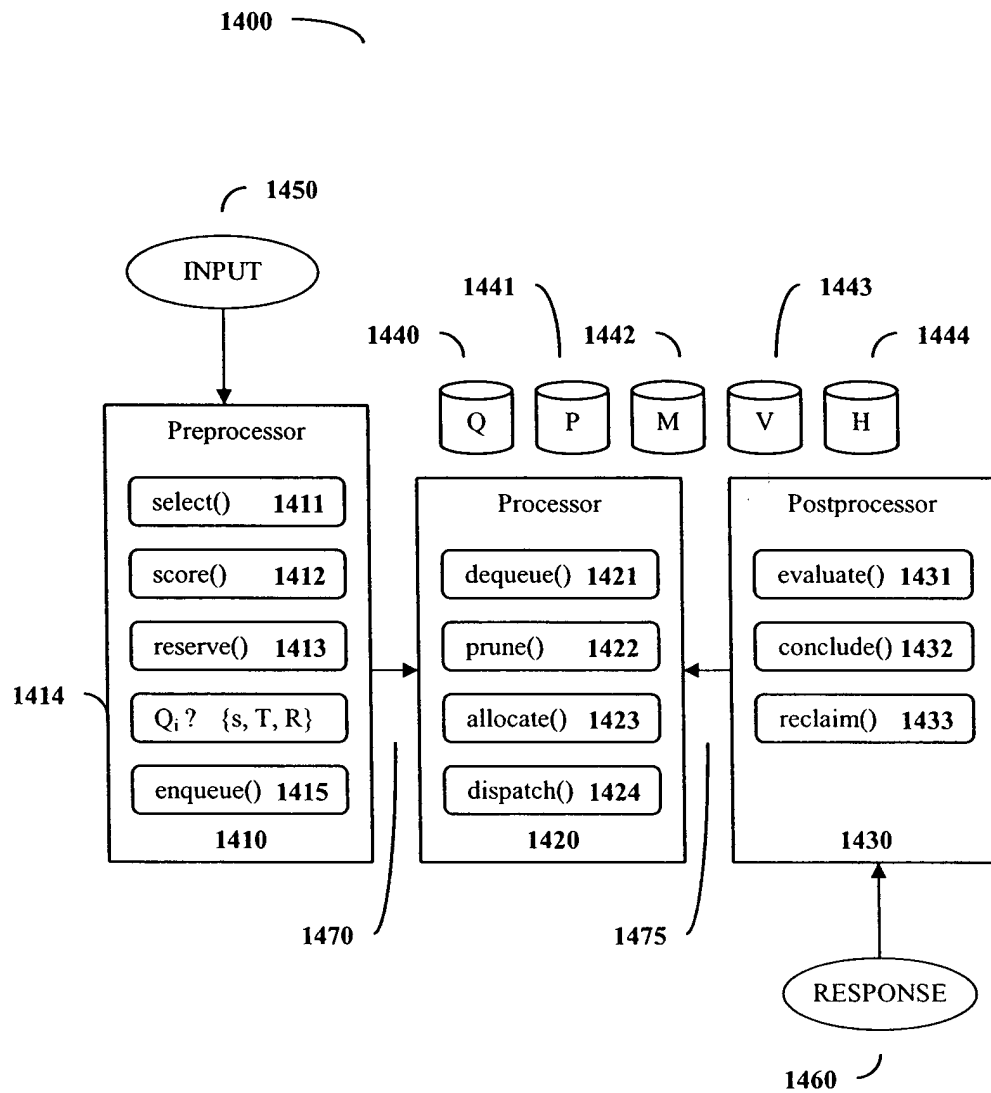


FIG. 14

Symbol	Descripti n
w_i	Worst-case time requirements for task i.
t_i	Period for task i.
d_i	Deadline for task i.
T	Set of tasks.
T_i	The i^{th} task characterized by $\{ [t_i] [d_i] w_i \}$.
c	The selection criteria for a set of tasks. Represents a collection of conditions, rules or other constraints. E.g., $c := \{ (\text{capability} = \text{'image conversion'}) \text{ AND } (\text{format} = \text{'tiff'}) \}$.
p	The profile for the owner of the task submission. Includes preferences, service contracts, provider relationships, etc.
j	Job submission as defined by $\{ c, p, T \}$
R_{all}	Set of all resources available to the systems.
R_i	The i^{th} resource.
R_{sub}	A selected subset of R_{all} that conforms to the selection criteria c .
R_{bid}	A refined subset of R_{sub} that satisfies negotiation criteria specified within p .
s	Priority score for an input set.
u	Response from a resource pertaining to completion of a task, T_i .
f	Feedback gleaned from a response u .
Q	Ready queue of input events awaiting dispatch processing.
Q_i	The i^{th} item in the ready queue defined by $\{ s, T, [R_{sub} R_{bid}] \}$.
Q_i^k	The k^{th} task of the i^{th} item from the ready queue defined by $\{ s, T_k \}$.
P	Pending queue of tasks processed by resources and awaiting results.
P_k	The k^{th} item in the pending queue as defined by $\{ s, T_k, R_i \}$
M	Mapped collection of task signatures to task results, to be described later. The collection M maintains a limited history of the actual results after processing of a task i .
V	Resource reservations list.
H	Historical information collection. Include observed performance metrics, service level agreement compliance, error rate, etc.

FIG. 14A

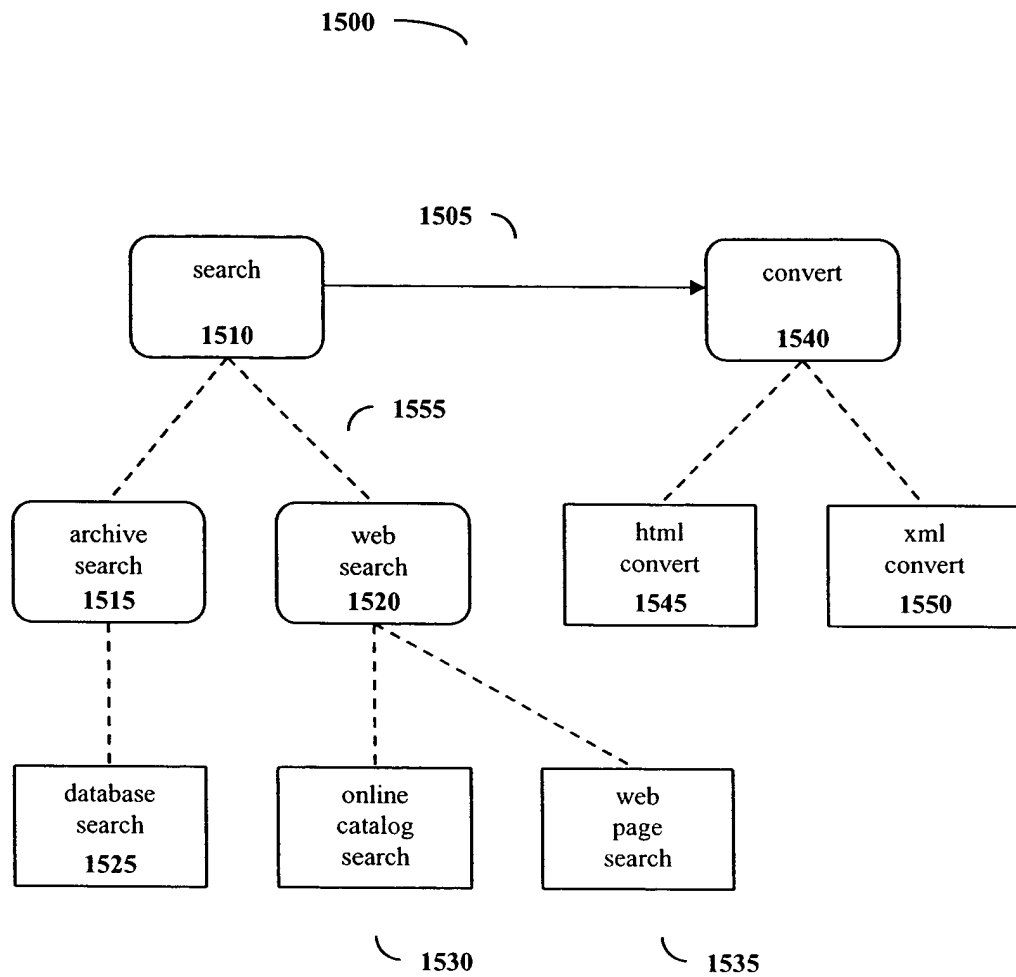


FIG. 15

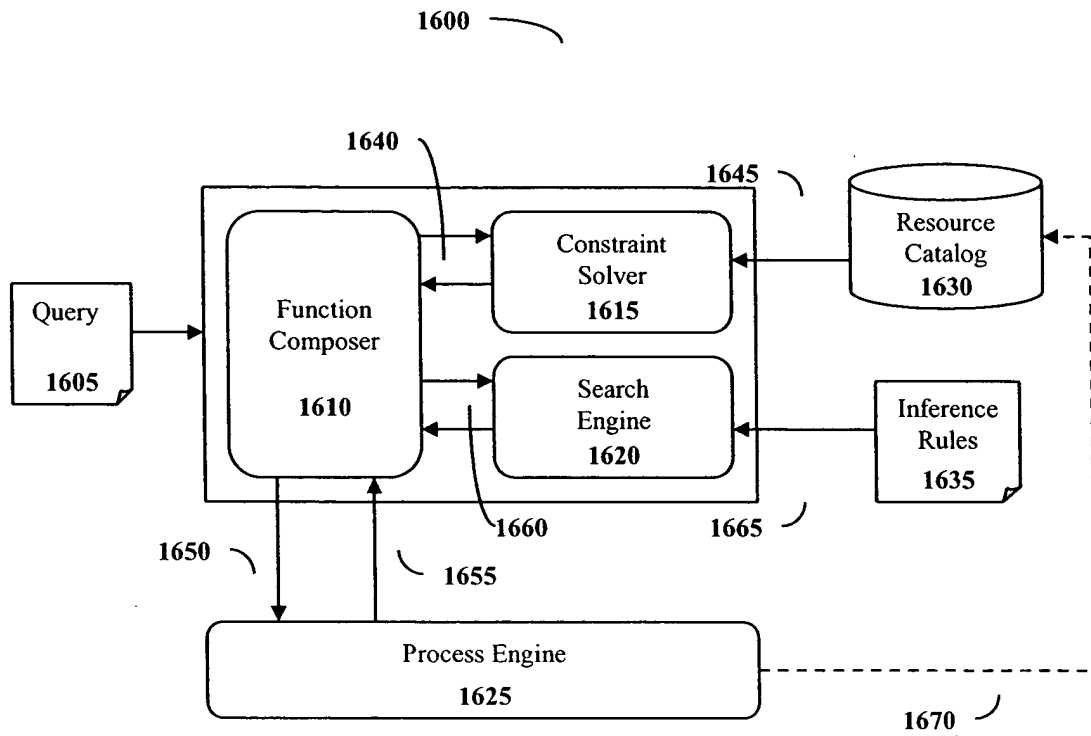


FIG. 16